

# Supertypes and Subtypes



# What Will I Learn?

## Objectives

In this lesson, you will learn to:

- Define and give an example of a subtype
- Define and give an example of a supertype
- State the rules relating to entities and subtypes; give examples of each
- Apply the rules of supertype and subtype by evaluating the accuracy of ER diagrams that represent them
- Apply the rules of supertype and subtype and include them in a diagram when appropriate



# Why Learn It?

## Purpose

Supertypes and subtypes occur frequently in the real world -- food orders (eat in, to go), grocery bags (paper, plastic), payment type (check, cash, credit). You can typically associate 'choices' of something with supertypes and subtypes. For example, 'what do you like on your sandwich' (mustard, mayonnaise, ketchup, onions, tomatoes, sprouts, cucumbers, lettuce, other).

Understanding real world examples helps us understand how and when to model them.



# Tell Me / Show Me

## Evaluating Entities

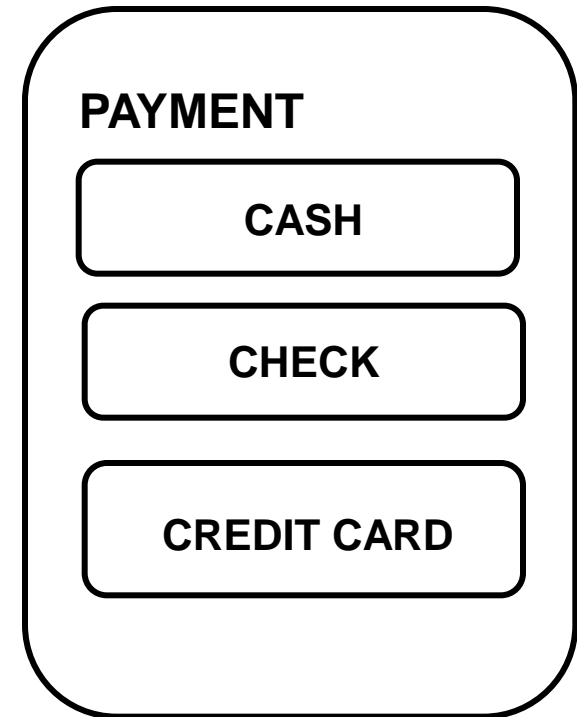
Often some instances of an entity have attributes and/or relationships which other instances do not have.

Imagine a business which needs to track payments from customers. Customers can pay by cash, by check or by credit card.

All payments have some common attributes: payment date, payment amount and so on. But only credit cards would have a “card number” attribute.

And for credit card and check payments we may need to know which CUSTOMER made the payment, while this is not needed for cash payments.

Should we create a single PAYMENT entity or three separate entities CASH, CHECK, and CREDIT CARD? And what happens if in the future we introduce a fourth method of payment?





## Tell Me / Show Me

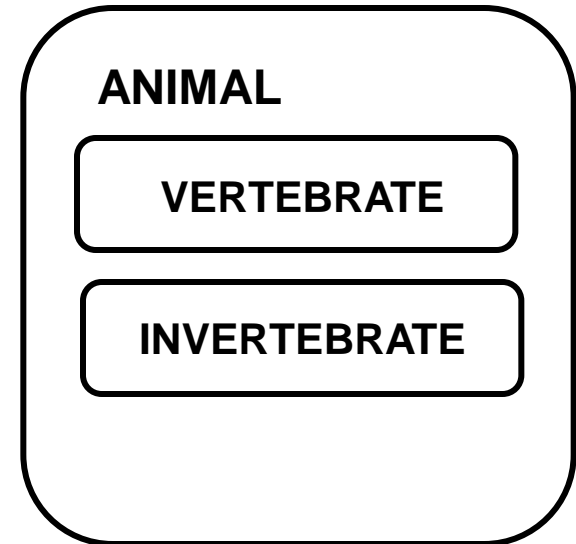
### Subdivide an Entity

Sometimes it makes sense to subdivide an entity into subtypes. This may be the case when a group of instances has special properties, such as attributes or relationships that exist only for that group. In this case, the entity is called a "supertype" and each group is called a subtype.

A subtype:

- inherits all attributes of the supertype
- inherits all relationships of the supertype
- usually has its own attributes or relationships
- is drawn within the supertype
- never exists alone
- may have subtypes of its own
- is also known as a "subentity"

Invertebrates are animals with no backbone (such as earth worms). Vertebrates have backbone and can be subdivided into birds, mammals, and reptiles etc.



**ANIMAL SUPERTYPE**

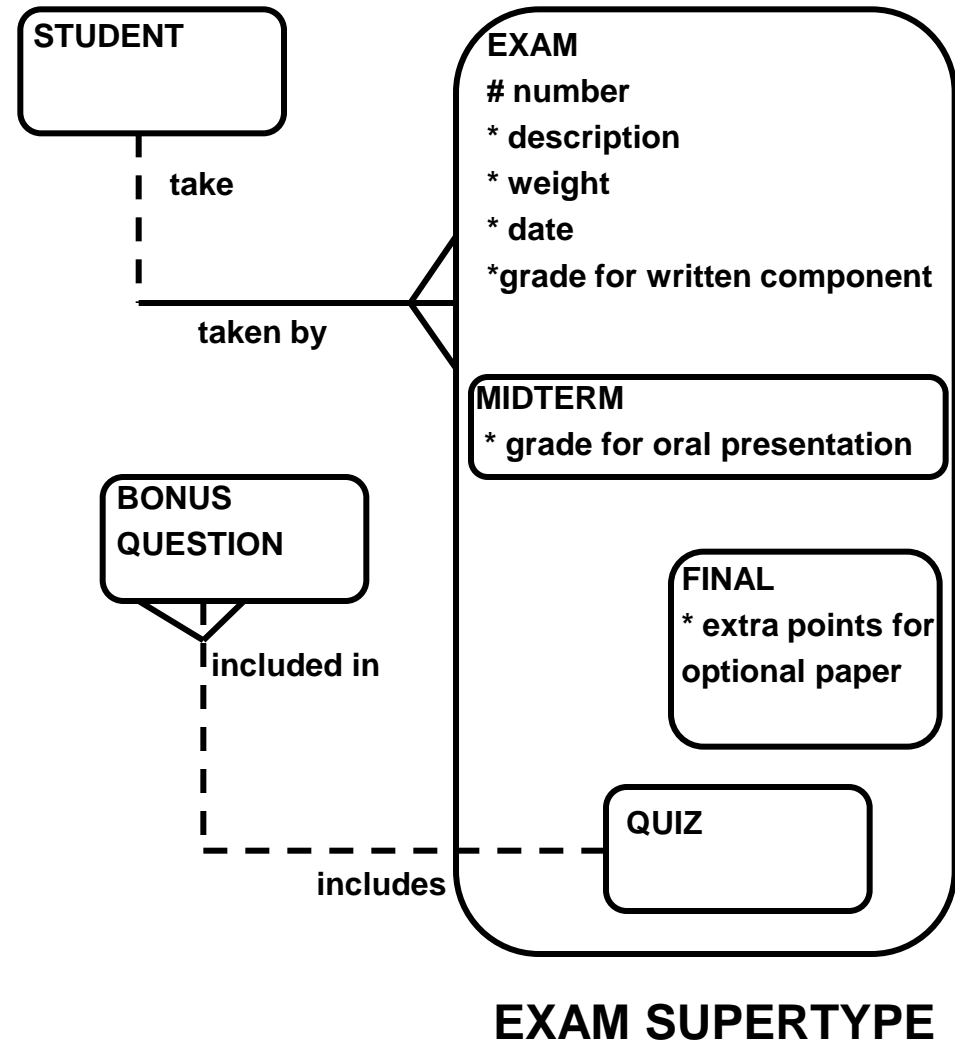


## Tell Me / Show Me

### Supertype Example

EXAM is a supertype of QUIZ, MIDTERM, and FINAL.

The subtypes have several attributes in common. These common attributes are listed at the supertype level. The same applies to relationships. Subtypes inherit all attributes and relationships of the supertype entity.





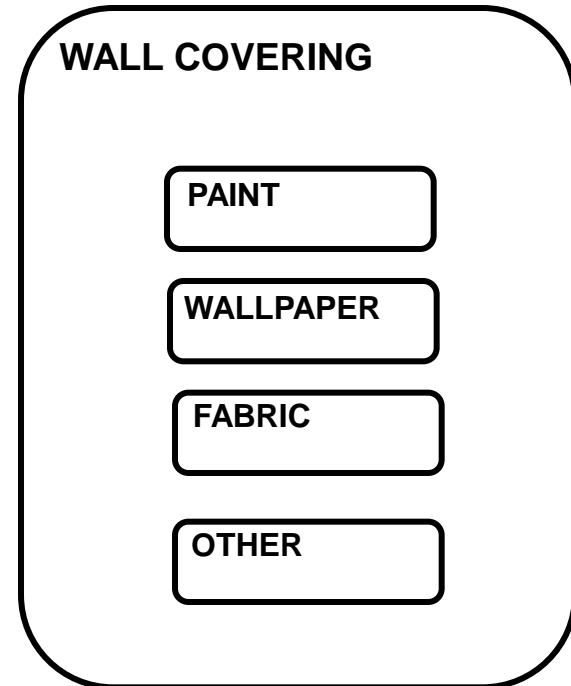
## Tell Me / Show Me

### Always More Than One Subtype

When an ER model is complete, subtypes never stand alone. In other words, if an entity has a subtype, there should always be at least a second subtype. This makes sense. What use would there be for distinguishing between an entity and the single subtype? This idea leads to the two subtype rules:

**Exhaustive:** Every instance of the supertype is also an instance of one of the subtypes.

**Mutually Exclusive:** Every instance of the supertype is of one and only one subtype.



### WALLCOVERING SUPERTYPE

At the conceptual modeling stage, it is good practice to include an **OTHER** subtype to make sure that your subtypes are exhaustive -- that you are handling every instance of the supertype.

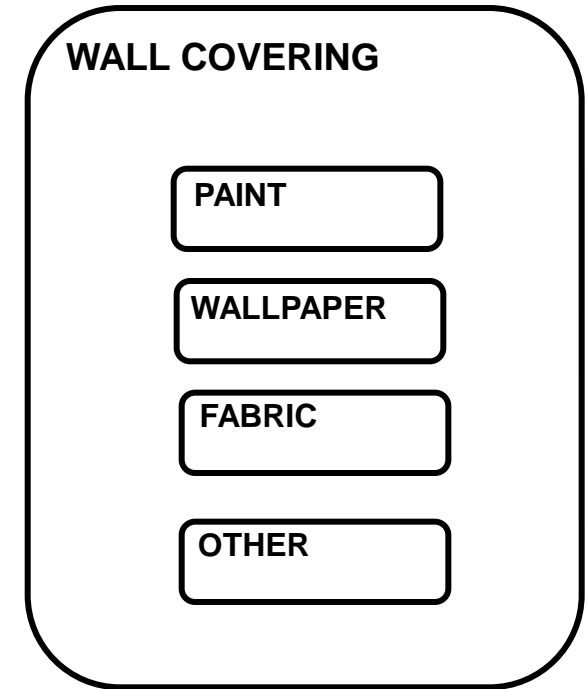


## Tell Me / Show Me

### Subtypes Always Exist

Every entity can always be subtyped. You can always make up a rule to subdivide the instances in groups.

But that is not the issue. The reason for subtyping should always be that there is a business need to show similarities and differences at the same time.



WALLCOVERING SUPERTYPE



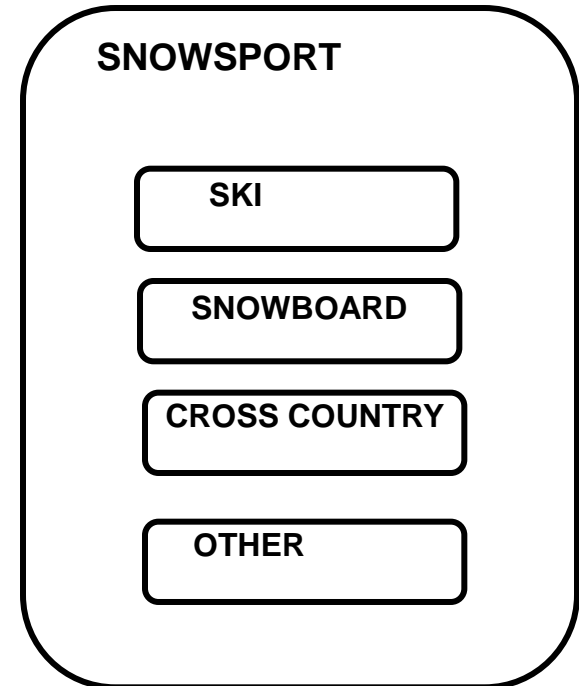


## Tell Me / Show Me

### Correctly Identifying Subtypes

When considering supertypes and subtypes, you can use three questions to see if the subtype is correctly identified:

- (1) Is this subtype a kind of supertype?
- (2) Have I covered all possible cases? (exhaustive)
- (3) Does the example fit into one and only one subtype? (mutually exclusive)



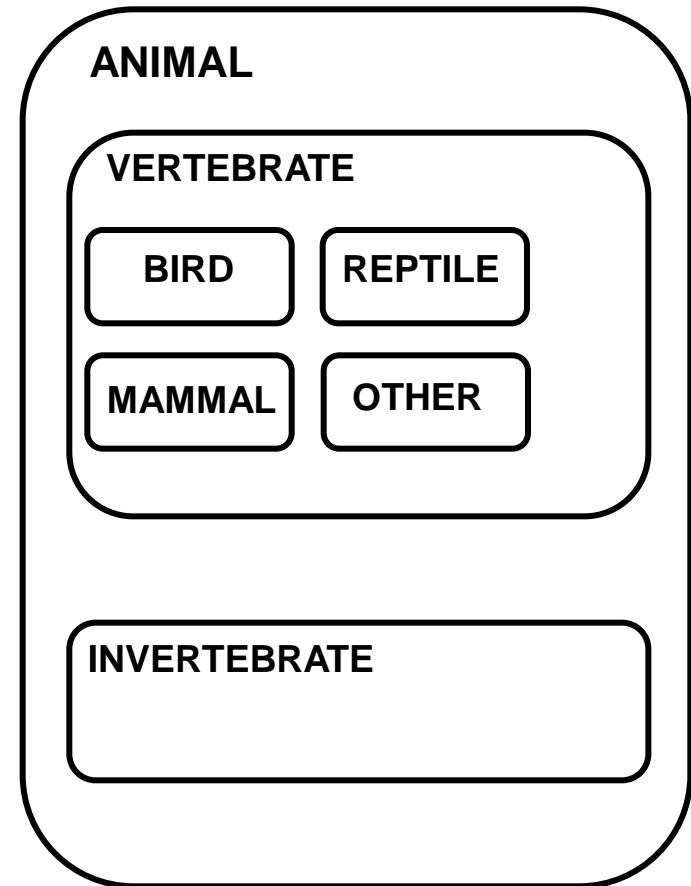


## Tell Me / Show Me

### Nested Subtypes

You can nest subtypes. For ease of reading --

“readability” -- you would usually show subtypes with only two levels, but there is no rule that would stop you from going beyond two levels.



**NESTED ANIMAL SUPERTYPE**



## Tell Me / Show Me

### Terminology

Key terms used in this lesson include:

Subtype / Subentity

Supertype

Exhaustive

Mutually Exclusive



# Summary

## Objectives Summarized

In this lesson, you have learned how to:

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- Define and give an example of a supertype
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# Summary

## Practice Guide

The link for the lesson practice guide can be found in the course resources in Section 0.